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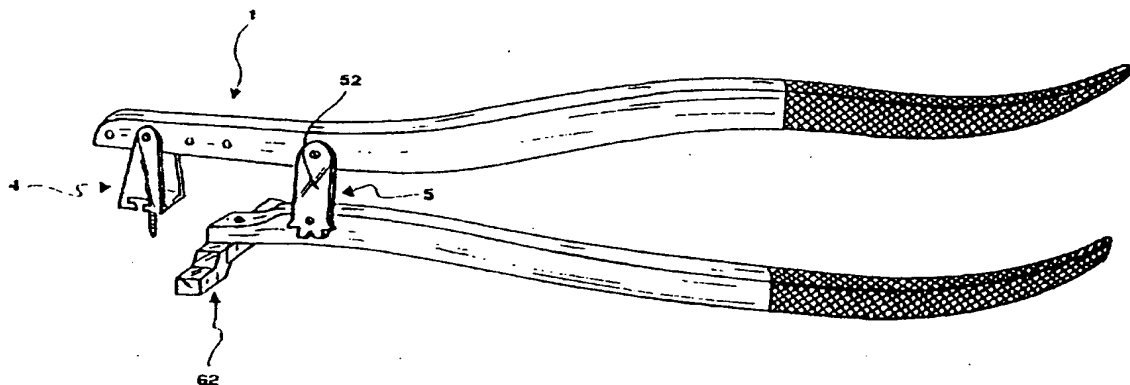
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(57) Abstract: Device (1), kit and method for simplifying the tooth root extraction process, said device comprising a first arm member (3), lever-operable within the oral cavity, and anchoring means (4), for anchoring the dental structure to be extracted to the arm member at an operative portion of the latter (Fig. 2).

WO 02/078561 A1

- 1 -

"DEVICE, KIT AND METHOD FOR TOOTH EXTRACTIONS"

DESCRIPTION

The present invention relates to a device, to a kit and to a related method for carrying out a tooth extraction.

5     The extraction of a tooth root is usually carried out by forceps or by thin and sharp levers. The latter ones are required in the cases, quite common, wherein the root to be extracted is totally incorporated in the related bone mass, hence lacking 'holding points' for gripping the root with a forceps. In this condition, moreover, the root edges are often hardly identifiable as totally or partially covered by the surrounding gingival mucosa.

10     In these cases, the lever is inserted between the bone juncture and an edge of the tooth root and then lever-rotated, so as to detach the root itself.

15     However, oft-times, due to the difficulties in isolating the root edges, the lever insertion cannot be readily carried out. In that case, first a gap between the bone and the root sufficing for said insertion is created by a bone cutter mounted on a dental drill.

20     The abovedescribed dental instruments of the known art and the associated root extraction techniques entail several relevant drawbacks.

25     The main drawback lies in the fact that the entire process proves extremely difficult for the dentist and distressing and traumatic to the patient. Moreover, often the action of the lever or even of the bone cutter determines an irreparable bone damage.

30     The technical problem underlying the present invention is that of providing a device, a kit and an associated method allowing to overcome the drawbacks hereto mentioned with reference to the known art.

Such problem is solved by a device for tooth extractions, comprising:

- 35     - a first arm member, lever-operable within the oral cavity; and  
- anchoring means, for anchoring the dental structure to

-2-

be extracted to said arm member at an operative portion of the latter.

5 The present invention further provides a kit for tooth extractions, comprising a dental device as abovedisclosed and at least one engaging member comprising a first portion apt to be fastened to the dental structure to be extracted and a second portion apt to engage said anchoring means.

10 According to the same inventive concept, the present invention also relates to a method for carrying out a tooth extraction, comprising the steps of:

- fastening an engaging member to the dental structure to be extracted;
- anchoring said engaging member to an extraction device; and
- 15 - operating said device for extracting said dental structure integrally to said engaging member.

The present invention provides several relevant advantages.

20 The main advantage lies in the fact that the present invention allows to simplify the root extraction process.

Other advantages, characteristics and operation modes of the present invention will be made apparent in the following detailed description of some embodiments thereof, given by way of example and not for limitative purposes. Reference will be made to the figures of the annexed drawings, wherein:

25 Fig. 1 is a partially exploded perspective view of a first embodiment of a device for tooth extractions according to the present invention;

30 Fig. 2 is a perspective view of the device of Fig. 1 in an assembled configuration;

Figs. 3A to 3C each show a perspective view related to a step of a root extraction method carried out by a kit for tooth extractions according to the present invention;

35 and  
Fig. 4 is a perspective view of the device of Fig. 1

-3-

during a final step of the extraction method of Figs. 3A-3C.

With initial reference to Figs. 1 and 2, a device for tooth extractions, and in particular for root extractions, is generally indicated with 1.

According to the invention, the device 1 comprises a first arm member 3 lever-operable within the oral cavity for carrying out the desired extraction. The member 3 is apt to be anchored to the dental structure to be extracted at an end portion thereof, which will hereinafter be referred to as operative end of the device 1, by anchoring means 4.

Then, at an end portion substantially opposite to the operative end, from now on referred to as handgrip end, such arm member 3 is actually apt to be grasped by an operator, typically a dentist.

In the present embodiment, the anchoring means 4 comprises an anchoring structure substantially shaped as a squared "U" in a front view, it also indicated with 4 and removably connectable to the first arm member 3. This connection is of the pivoting type, in order to have the structure 4 rotatable with respect to the first arm member 3.

Always in the present embodiment, the device 1 also comprises a second arm member 2, apt to be rested in the oral cavity according to modes that will be illustrated hereinafter, connected to the first arm member 3 at an intermediate portion thereof and movable with respect thereto. Hence, the device 1 of the present embodiment has a substantially forceps-shaped structure.

Always in the present embodiment, the device 1 further comprises adjustment means 5 for adjusting the relative position of the two arm members 2 and 3.

Each of the hereto introduced components will hereinafter be described in greater detail with reference to the specific embodiment considered.

The second arm member 2 has, at an operative end

- 4 -

portion thereof, a bearing seat 61, apt to receive in reversible engagement an engaging bar 63 of an elongated bearing appendix 62.

5 The bearing appendix 62 comprises a shaped bridge 64 extending in a direction substantially orthogonal to the bar 63. Such bridge 64 has a substantially flattened-"V" configuration, with two flat-bottomed side ends 65. Each of the latter is apt to abut one or more teeth, adjacent or not, into the patient's oral cavity. In particular, 10 the hereto disclosed specific configuration of the shaped bridge 64 makes the latter particularly apt to abut onto the patient's incisor teeth.

Once the connection of the bearing appendix 62 to the second arm member 2 has been carried out, the bridge 64 15 is arranged substantially orthogonal to the prevailing direction of development of the device 1, in order to ensure a stable and firm bearing during the extraction.

In Fig. 1, the connection of the bearing appendix 62 to the second arm member 2 is schematically represented as 20 carried out with a traditional connecting means, like, e.g., a screw. It is understood that alternative embodiments may provide different connecting modes, like, e.g., a reversible restrained joint.

Preferably, the bearing appendix 62 is made of Teflon 25 or of other mechanically equivalent material.

According to a simplified embodiment of the device of the invention, the abovedisclosed bearing appendix is absent. Hence, a direct contact between the operative end of the second arm member 2 and the bearing teeth, or a 30 contact mediated by a mere buffer of a substantially parallelepiped shape may be provided.

In order to implement the abovementioned adjustment means 5 of the relative position of the two arms 2 and 3, the second arm member 2 has, in a position displaced 35 towards the grip end with respect to the bearing seat 61, a grooved seat 51, apt to cooperate with a toothed end portion 53 of an elongated adjusting member 52. To this

- 5 -

aim, the seat 51 has a plurality of side-by-side tracks, each apt to receive a tooth of said toothed portion 53.

In particular, the tilt of the adjusting member 52 with respect to the second arm member 2 can be varied  
5 modifying the tooth-track pairs of the portion 53 and of the engaged seat 51, respectively. Once the member 52 has been brought into a desirable position, it can be fastened, in this position, to the second arm member 2 by a connecting means of a traditional type, e.g., a  
10 threaded pin 54.

At the end portion opposite to the toothed portion 53, the adjusting member 52 is then pivotally connected by traditional means to the first arm member 3.

The first arm member has, in a position displaced  
15 towards the operative end with respect to the adjusting member 52, a plurality of anchoring seats 41. Each of the latter is apt to receive a connecting pin 42 for allowing the abovementioned reversible pivotable connection between the anchoring structure 4 and the arm 3 itself.  
20 The pin 42 may, e.g., be of the type having a butterfly stop nut (not shown in the figures.).

The anchoring structure 4 has, at each of two side walls defining the branches of the "U", a respective seat 43 apt to receive the pin 42.

Moreover, the structure 4 has, at the bottom of the  
25 "U", a shaped opening 44 for receiving in reversible engagement an engaging member 7 apt to be fastened to the tooth root. In particular, the opening 44 extends onto the wall corresponding to the bottom of the "U" starting  
30 from a side wall section of the structure 4 adjacent thereto.

In the present embodiment, the engaging member 7 is a dental screw comprising a first portion, in particular a  
stem 71, apt to be fastened to the root to be extracted.  
35 The stem 71 has means for gripping onto the dental structure to be extracted, in particular an external thread 73, typically wide-pitched, for easing the

- 6 -

insertion and the grip thereof within the root canal.

The engaging member 7 further comprises a second portion, in particular a hexagon-shaped head 72, apt to engage said opening 44. In particular, the hexagon head 72 can be inserted sideways into the opening 44 and slid inwards of the "U", so as to be retained therein.

The first and the second arm member 3 and 2 further have respective grip end portions 21 and 31, apt to be grasped by the dentist. In order to ease the grasping, such portions 21 e 31 may have an outer knurl or anyhow an anatomical configuration apt to provide a firm handgrip.

The various components of the device 1 hereto disclosed, and in particular the actual forceps structure formed by the two arms 2 and 3, the bearing appendix 62 and the anchoring structure 4 may be provided to an end user as a kit.

Such kit may further comprise one or more canal screws 7 as hereto disclosed, having various cross sections, so that the kit may meet different extraction requirements.

For likewise reasons, the kit may also comprise a plurality of anchoring structures of various shapes and dimensions.

The kit may further comprise a handling tool 8, shown in Fig. 3B, for inserting the screw 7 into the root canal, and a canal reamer, schematically shown in Fig. 3A, for widening the root canal prior to the insertion of the screw 7.

In the present embodiment, the tool 8 has a knurled handling head 81, apt to be handled by the dentist directly or by a dedicated instrument received into a suitable seat in the head itself.

The tool 8 further has a tubular end portion 82 of hexagonal section. The latter is apt to receive in reversible joint the head 72 of the screw 7, thereby allowing the dentist to rotate the latter for the insertion thereof into the root canal.

- 7 -

The canal reamer, possibly actuated with a suitable micromotor, is of a traditional type and a further description thereof will be omitted.

However, it will be understood that the kit of the invention may also comprise a set of reamers and of handling tools of different configuration and section.

The operation modes of the device and of the kit of the invention will hereinafter be disclosed with reference to Figs. 3A, 3B, 3C and 4. In order to make apparent the variety of the possible applications of the invention, in Figs. 3A, 3B and 3C the teeth were shown as molars by way of example, whereas in Fig. 4 they were depicted as incisors to make more readily appreciable the advantages of the configuration of the bearing appendix 62 of the present embodiment.

Firstly, casewise the dentist separates the tooth roots with a bone cutter, according to a traditional technique well-known to those skilled in the art.

Then, the dentist reams the root canal with the canal reamer of the kit, in order to widen the seat for the insertion of the canal screw 7, as shown in Fig. 3A.

Then, as shown in Fig. 3B, the dentist inserts the canal screw 7 within the suitably reamed root canal, using the suitable handling tool 8 according to the aboveillustrated modes.

Then, as shown in Fig. 3C, the shaped head 72 of the screw 7 can be inserted through the opening 44 of the anchoring structure 4 and slid within such opening 44 until the stem 71 abuts the inside edge thereof.

Always with reference to Fig. 3C, the structure 4 can then be connected to the first arm member 3, in order to complete the anchoring of the tooth root to the device 1.

It will be appreciated that the plurality of anchoring seats 41 allows an adjustment of the position of the anchoring means 4 with respect to the arm 3, enhancing the versatility of the device 1.

With reference now to Fig. 4, the second arm member 2



- 8 -

is then rested into the oral cavity at the bearing appendix 62, which will have previously been mounted onto the arm member 2 itself.

Then, the device 1 can be operated for extracting the root at issue, acting onto the grip portions 21 and 31 of the arm members 2 and 3, respectively. In particular, levering onto the second arm 2 at the bearing region thereof into the oral cavity, the dentist rotates the first arm 3 with respect to the second arm in order to pull near the respective handgrip portions 21 and 31. This motion induces the moving away of the anchoring structure 4, and therefore of the root fastened thereto, from the anatomical seat of the latter, thus determining the desired extraction.

It will be understood that the adjusting means 5 may be handled prior to or after the insertion of the device 1 into the oral cavity, for adjusting the relative position of the two arm members 2 and 3 and hence the extractive tilt of the lever. In particular, acting on such means 5 a more or less transversal pulling direction can be attained.

It will be appreciated that the pivotable connection between the structure 4 and the first arm member 3 allows to attain a gradual extractive motion which follows a prevalent extractive direction natural and effective.

It will also be appreciated that, during the extracting motion, the Teflon construction of the bearing appendix 62 allows to attain a satisfactory compromise between resistance and elasticity in the bearing region.

Moreover, it will now be better appreciated that the device, the kit and the method of the invention allow to drastically simplify the root extraction process and to reduce the required time therefor, even in the case of tooth roots of difficult access.

In particular, the device of the invention represents an effective alternative to the use of levers as well as of forceps, and, above all, it dispenses from the use of

- 9 -

bone cutters.

Furthermore, the extraction surgery is less distressing and traumatic to the patient with respect to the state of the art techniques, as well as safer and more repeatable, allowing a reduction of the convalescence times and of the risk of permanent damage to the bone structure and to the oral cavity in general.

The abovementioned advantages assume a remarkable importance in light of the fact that the recent development of dental implantology requires non-traumatic pre-implant extractions, in order to avoid damaging the terrain which subsequently shall integrate the bone implant.

Moreover, although the invention has hereto been described with reference to a root extraction, it is understood that it may generally apply to the extraction of any tooth structure. In particular, the invention may apply to whole-tooth extractions, e.g., where the use of levers be inadvisable or even technically impossible.

It will be understood that the hereto disclosed embodiment allows a simple and cost-effective manufacture of the device of the invention. However, the various components of the kit hereto disclosed, and in particular the bearing appendix, the anchoring structure and the engaging member, are susceptible of several alternative embodiments, in terms of configuration as well as of dimensions, to adapt to the specific patient's needs and to the type of root extraction.

For instance, alternatively to the abovedescribed plurality of seats 41, the use of dedicated adjustment means for adjusting the position of the anchoring means 4 with respect to the first arm member 3 may be provided.

Furthermore, another simplified embodiment of the invention provides that the bearing appendix and the anchoring structure are irreversibly jointed, rigidly or not, to the second and to the first arm member 2 and 3, respectively.

- 10 -

Moreover, according to a further embodiment the anchoring means have a slideable rather than a pivotable connection to the first arm member, still allowing a root-removing motion.

5 Moreover, concerning the engaging member, it may also be an insert substantially analogous to the inserts used for anchoring items to walls, and in particular provided, as gripping means, with side flaps.

10 Finally, it will be understood that, in light of a further simplified embodiment, the device of the invention does not comprise the abovedescribed second arm member. In fact, such device may also be implemented by a single arm member analogous to the first arm member hereto described, connected or connectible to anchoring  
15 means as abovedescribed at an end or at an intermediate portion thereof.

Moreover, this single arm member may be connected or connectable also to bearing means, like, e.g., the abovedescribed bearing appendix, which may be arranged at  
20 an end or at an intermediate portion thereof.

In light of this simplified embodiment, in order to carry out the tooth extraction the operator rotates the arm member levering onto the bearing region into the oral cavity.

25 The present invention has hereto been described with reference to preferred embodiments thereof. It has to be understood that other embodiments may exist, afferent to the same inventive core and all falling within the protective scope of the annexed claims.

- 11 -

CLAIMS

1. A device (1) for tooth extractions, comprising:
  - a first arm member (3), lever-operable within the oral cavity; and
  - 5 - anchoring means (4), for anchoring the dental structure to be extracted to said arm member at an operative portion of the latter.
2. The device (1) according to claim 1, wherein said anchoring means (4) is removably connectable to said arm member (3).
- 10 3. The device (1) according to claim 2, wherein said arm member (3) has a plurality of anchoring seats (41), each apt to receive in removable engagement said anchoring means (4).
- 15 4. The device (1) according to any one of the preceding claims, wherein said anchoring means (4) is pivotally connected or connectable to said arm member (3).
5. The device (1) according to any one of the preceding claims, wherein said anchoring means comprises an anchoring structure (4) having a shaped opening (44) apt to removably receive an engaging member (7) fastened to the dental structure to be extracted.
- 20 6. The device (1) according to claim 5, wherein said anchoring structure (4) is substantially shaped as a squared «U», said shaped opening (44) being obtained at the bottom of said «U».
- 25 7. The device (1) according to any one of the preceding claims, comprising a second arm member (2) apt to be rested within the oral cavity, connected to said first arm member (3) at an intermediate section thereof and movable with respect thereto.
- 30 8. The device (1) according to claim 7, wherein said first arm member (3) is pivotally connected to said second arm member (2).
- 35 9. The device (1) according to claim 7 or 8, comprising adjustment means (5) for adjusting the relative position of said arm members (2, 3).

-12-

10. The device (1) according to claim 9, wherein said adjusting means (5) comprises a grooved seat (51) obtained in one of said arm members (2, 3) at said connection between said arm members, and a toothed member (52) interposed between said arm members, having a first toothed portion (53) apt to engage said grooved seat and a second portion connected to the other of said arm members.

11. The device (1) according to any one of the preceding claims, comprising an elongated bearing appendix (62), connected or connectable to the remaining part of said device.

12. The device (1) according to claim 11, wherein said bearing appendix (62) comprises a shaped bridge (64) apt to be arranged substantially orthogonally to a prevailing direction of development of said device.

13. The device (1) according to claim 11 or 12, wherein said bearing appendix (62) is made of Teflon.

14. A kit for tooth extractions, comprising a dental device (1) according to any one of the claims 1 to 13 and at least one engaging member (7) comprising a first portion (71) apt to be fixed to the dental structure to be extracted and a second portion (72) apt to engage said anchoring means (4).

15. The kit according to claim 14, wherein said at least one engaging member (7) comprises means (73) for gripping onto the dental structure to be extracted.

16. The kit according to claim 15, wherein said at least one engaging member is a dental screw (7).

17. The kit according to claim 15 or 16, comprising a handling tool (8) for fastening said engaging member (7) to the dental structure to be extracted.

18. The kit according to any one of the claims 14 to 17, comprising at least one canal reamer.

19. A method for carrying out a tooth extraction, comprising the steps of:

- fastening an engaging member (7) to the dental

- 13 -

structure to be extracted;

- anchoring said engaging member to an extraction device (1); and

5     - operating said device for extracting said dental structure integrally to said engaging member.

20. The method according to claim 19, wherein said dental structure is a tooth root and said step of fastening an engaging member (7) to the dental structure provides a step of reaming the root canal and a subsequent step of  
10     inserting said engaging member within the reamed canal.

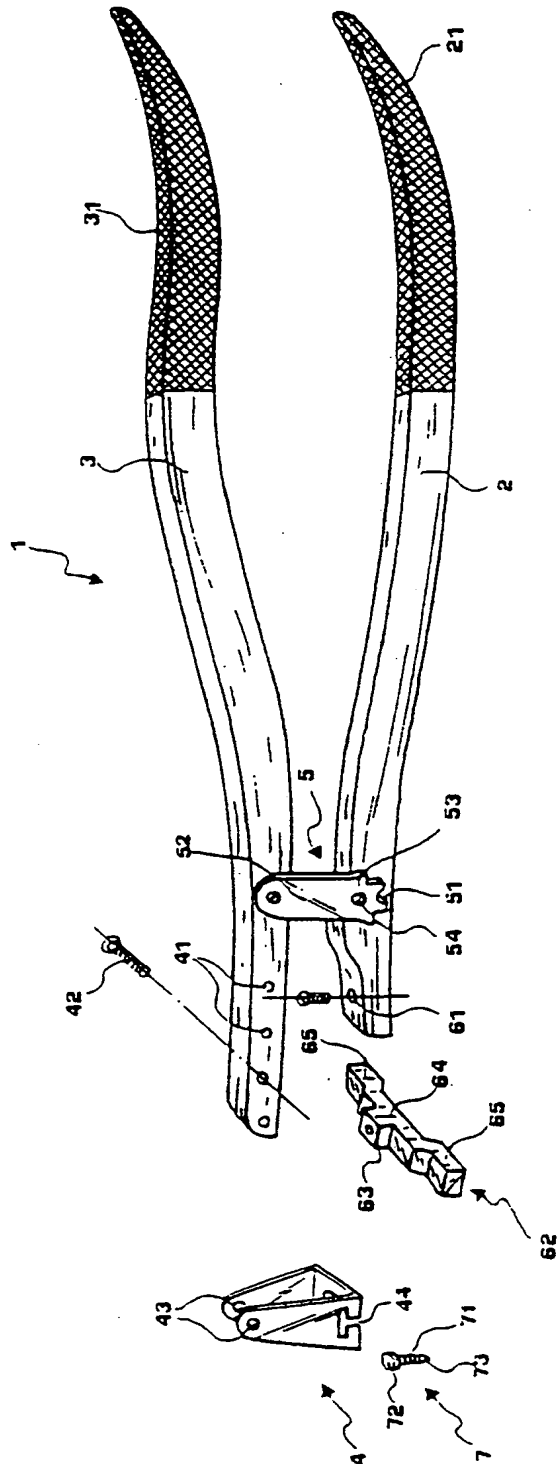


fig.1

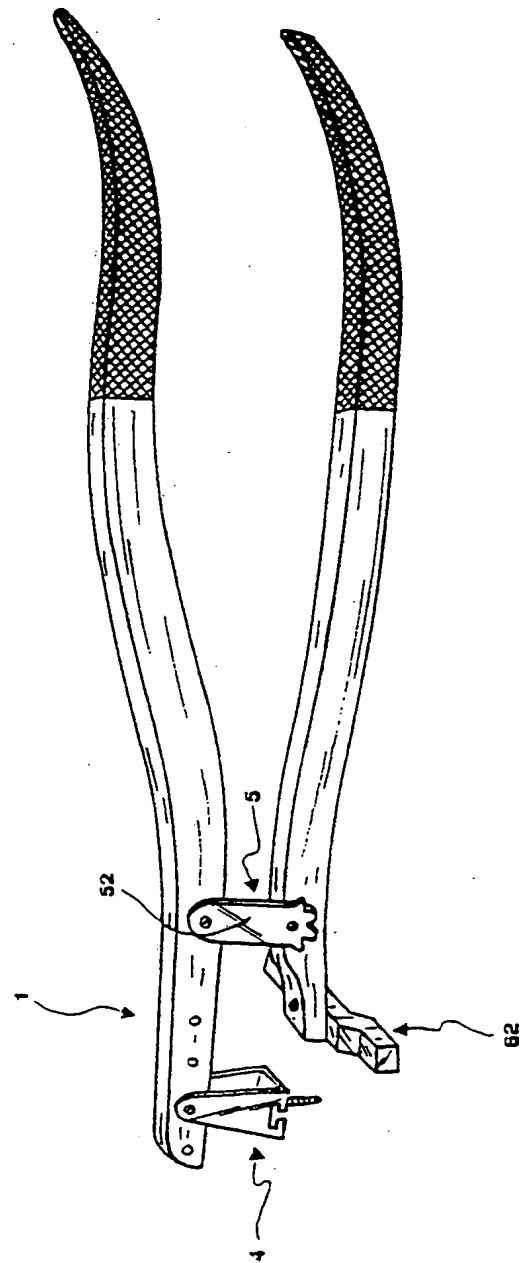


fig.2

- 2/3 -

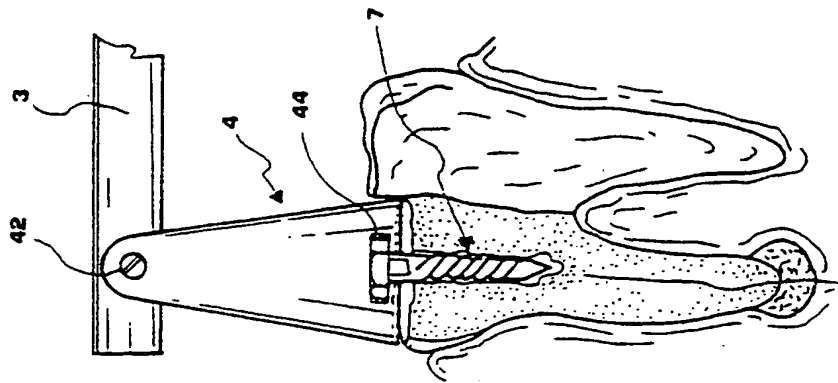


fig. 3c

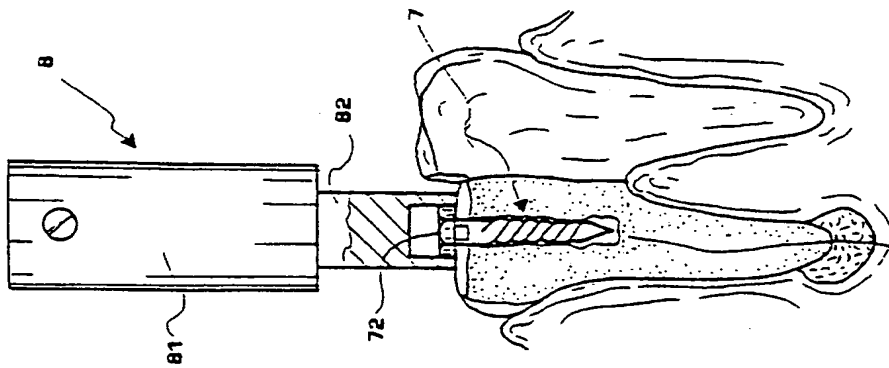


fig. 3b

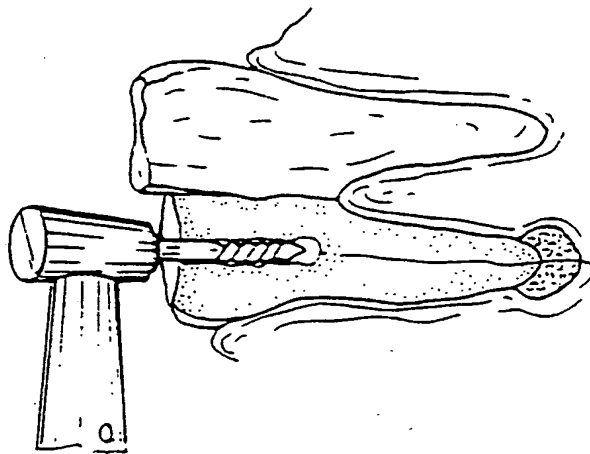


fig. 3a



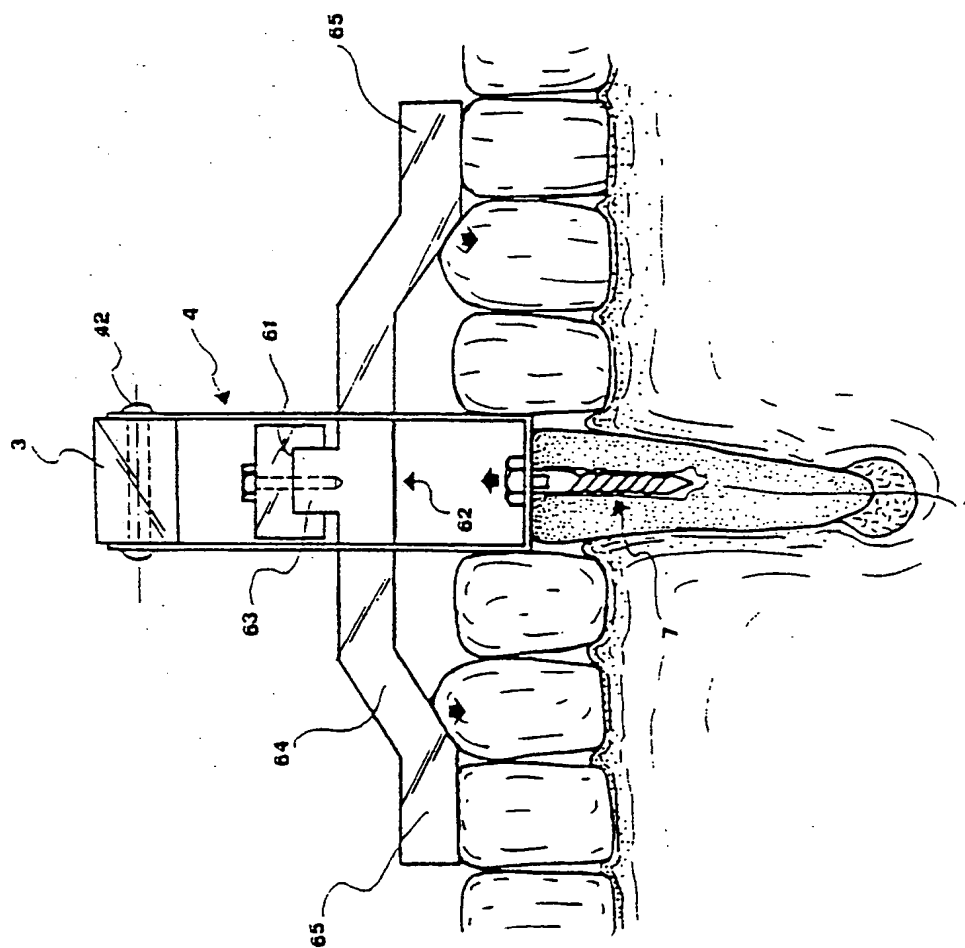


fig. 4

## INTERNATIONAL SEARCH REPORT

International Application No.

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A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7. A61C3/14

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 230 454 A (LOCOCO MICHAEL P) 28 October 1980 (1980-10-28) column 1, line 61 -column 4, line 68; figures	1,2,4,5, 11-15,17
X	DE 198 15 133 A (WILLIG KURT) 7 October 1999 (1999-10-07) column 1, line 10 -column 1, line 54; figures	1-4,7,8, 11,13
A		14-18
X	US 4 443 196 A (RICO MIGUEL) 17 April 1984 (1984-04-17) column 2, line 38 -column 4, line 46; figures	1,2,4, 7-9
A		14-18
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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# INTERNATIONAL SEARCH REPORT

International Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X  A	DE 10 13 392 B (DR. HUGO ACKERMANN) 8 August 1957 (1957-08-08) the whole document  -----	1-4, 11, 14  14-18

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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DE 1013392	B		NONE		